

Assimilation of Quality Controlled AIRS Temperature Profiles using the NCEP GFS

Joel Susskind, Oreste Reale, Lena Iredell, and Bob Rosenberg
NASA GSFC Earth Sciences Division-Atmospheres
Greenbelt MD 20771

Abstract

We have previously conducted a number of data assimilation experiments using AIRS Version-5 quality controlled temperature profiles as a step toward finding an optimum balance of spatial coverage and sounding accuracy with regard to improving forecast skill. The data assimilation and forecast system we used was the Goddard Earth Observing System Model, Version-5 (GEOS-5) Data Assimilation System (DAS), which represents a combination of the NASA GEOS-5 forecast model with the National Centers for Environmental Prediction (NCEP) operational Grid Point Statistical Interpolation (GSI) global analysis scheme. All analyses and forecasts were run at a $0.5^\circ \times 0.625^\circ$ spatial resolution. Data assimilation experiments were conducted in four different seasons, each in a different year. Three different sets of data assimilation experiments were run during each time period: Control; AIRS T(p); and AIRS Radiance. In the "Control" analysis, all the data used operationally by NCEP was assimilated, but no AIRS data was assimilated. Radiances from the Aqua AMSU-A instrument were also assimilated operationally by NCEP and are included in the "Control". The AIRS Radiance assimilation adds AIRS observed radiance observations for a select set of channels to the data set being assimilated, as done operationally by NCEP. In the AIRS T(p) assimilation, all information used in the Control was assimilated as well as Quality Controlled AIRS Version-5 temperature profiles, i.e., AIRS T(p) information was substituted for AIRS radiance information. The AIRS Version-5 temperature profiles were presented to the GSI analysis as rawinsonde profiles, assimilated down to a case-by-case appropriate pressure level p_{best} determined using the Quality Control procedure. Version-5 also determines case-by-case, level-by-level error estimates of the temperature profiles, which were used as the uncertainty of each temperature measurement. These experiments using GEOS-5 have shown that forecasts resulting from analyses using the AIRS T(p) assimilation system were superior to those from the Radiance assimilation system, both with regard to global 7 day forecast skill and also the ability to predict storm tracks and intensity.

Thanks to the help of Lou Uccellini Director of NCEP, and Tsengdar Lee at NASA HQ, we have been able to successfully port and run the NCEP GFS data assimilation system at GSFC. We have recently begun to conduct analogous data assimilation experiments at GSFC to those we performed using GEOS-5 in order to assess the extent, if any, that the approach of assimilation of Quality Controlled AIRS T(p) retrievals, in place of assimilation of AIRS Observed radiances, could potentially improve NCEP operational forecasting skill. Results of these experiments will be shown at the meeting.